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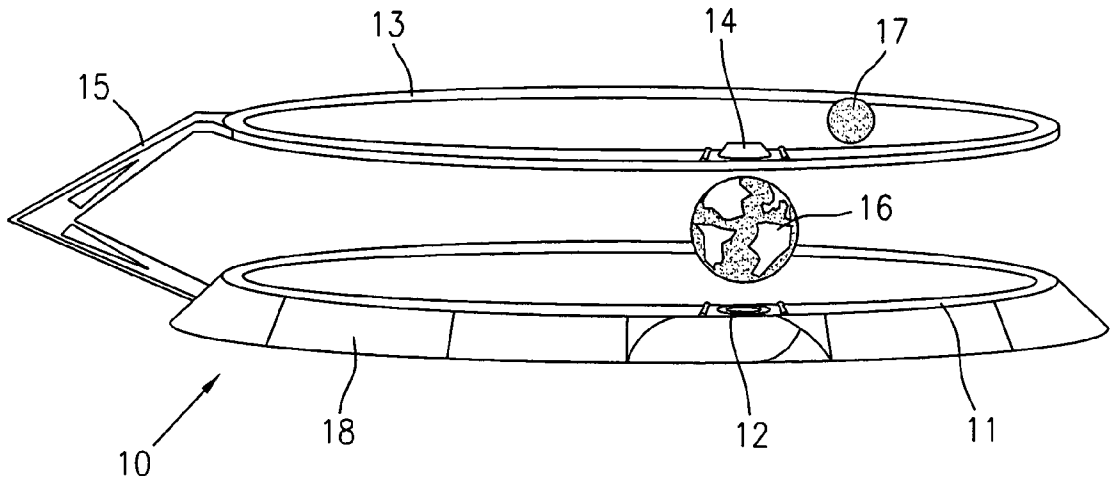
(54) **Title:** MAGNETIC LEVITATION AND CONVEYANCE SYSTEM FOR A FLOATING BODY



(57) **Abstract:** A system for magnetic levitation and conveyance of a floating body (16; 42) along a running path (11 , 13; 40), by entraining motor-powered carriages (12, 14; 45); the carriages (12, 14; 45) are provided with electromagnetic solenoids (SL) for generating a levitation magnetic field and for the entrainment of the body (16; 42) in a floating condition, and sensors (22 23) for detecting the positions of the floating body (16; 42) along the path (11 , 13; 40). A microprocessor (MP) controls the movement of the carriages (12, 14; 45) and the solenoids (SL) for levitation and entrainment of the floating body (16; 42), in relation to reference signals received from the sensors (22 23). The system is suitable for use in equipments having different functionalities.

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MAGNETIC LEVITATION AND CONVEYANCE SYSTEM FOR A FLOATING BODY

BACKGROUND OF THE INVENTION

This invention refers to the magnetic levitation of bodies, and in particular is addressed to a system for magnetic levitation and conveyance or entrainment of floating bodies.

The invention is suitable for an equipment comprising a similar magnetic levitation and conveyance system, for different purposes and functionalities.

STATE OF THE ART

Magnetic levitation of floating bodies has been variously proposed and used for maintaining moving objects in a suspended condition, or for maintaining objects of various types in a stable floating state. Several examples of static and/or dynamic levitation systems are described in EP-A-193 664, US-A-3 892 185 and US-A-5 319 336.

Levitation systems of this kind have been suggested for use in specific fields and for limited purposes, for example for simply creating attraction and arousing curiosity, or for engineering complex and sophisticated transporting and conveying systems.

OBJECTS OF THE INVENTION

The main object of the invention is to provide an improved magnetic levitation system for entrainment and conveyance of moving bodies, suitable for general use in equipment having different functionalities.

A further object of the invention is to provide a magnetic levitation system for suspension and conveyance of moving bodies in a floating condition, which utilises a simple, highly versatile solution which can be implemented with various supplementary functions, not contemplated and not made possible with magnetic levitation systems hitherto known.

A still further object is to provide a similar magnetic levitation and conveying system suitable for use in different fields, for example for creating a calendar with orbital movement of a planet or an astral body, for sending messages and/or information by remote activation of the system itself, in the advertising field, in the transporting of objects, as well as in the games field, as

will be explained further on.

BRIEF DESCRIPTION OF THE INVENTION

The above can be achieved by a magnetic levitation system for entrainment and conveyance of a floating body, which is moved along a running path, characterised by comprising:

at least one electrified track;

motor-driven carriage means movable along said track, the carriage means being provided with magnetic field generating means for levitation, entrainment and conveyance of the floating body along the running path;

at least a first and a second detecting sensors for providing reference signals relating to actual vertical and longitudinal positions of the floating body along the track on which the carriage means runs; and

circuit means operatively connected to the electrified track and to said electromagnetic means for generation the magnetic fields, respectively to the detecting sensors, said circuit means comprising a programmable control unit to provide control signals to the motor-driven carriage means and to the magnetic field generating means, in relation to reference signals provided by the detecting sensors of the system.

BRIEF DESCRIPTION OF THE DRAWINGS

The general features of the magnetic levitation, entraining and conveying system according to the invention, and some possible embodiments, will be described in greater detail hereunder, with reference to the examples of the drawings, in which:

Figure 1. shows a perspective view of a first embodiment of an apparatus incorporating the system according to the invention, for an orbital calendar;

Figure 2. is an enlarged view of fig. 1, showing a data and/or information display;

Figure 3. shows a top view of the upper track and carriage;

Figure 4. shows a partial cutaway side view of the upper track and carriage;

Figure 5. shows a top view of the lower track and carriage;

Figure 6. shows a block diagram of the levitation control circuit;

Figure 7. shows a block diagram of the control circuit for the orbiting movement;

Figure 8. shows a block diagram of the control circuit for rotation;

Figure 9. is a first flow chart showing another working principle of the magnetic levitation;

Figure 9A. is shows a second flow chart showing another working principle of the magnetic levitation;

Figure 10. shows a flow chart for controlling the position of the carriages and for the entrainment of the floating body;

Figure 11. shows a flow chart for controlling the rotation of the floating body;

Figure 12. shows a second embodiment of the system with suspending and conveying carriage acting from above;

Figure 13. shows a top view of the track and the carriage of fig. 12;

Figure 14. shows a third embodiment of the system with suspending and conveying carriage acting from below;

Figure 15. shows a top view of the track and the carriage of fig. 14;

Figure 16. shows a top view of a further embodiment;

Figure 17. shows an enlarged side view along the line 17-17 of figure 16.

DETAILED DESCRIPTION OF THE INVENTION

The general features and the working principle of the invention will be described in greater detail hereunder with reference to the figures 1-9 relating to a specific example having the function of an orbital calendar, with magnetic levitation of a floating body, as described hereunder.

The example of fig. 1 concerns an orbital calendar of magnetic levitation type , reproducing either the revolution movement of the earth, of a generic planet, or an astral body moving around the sun and the rotational movement of the same earth or a generic planet around its own axis, while it is magnetically levitated, entrained and conveyed along an annular path, similar to the terrestrial orbit. However, what is described hereunder can refer to any other planet, a hypothetical solar system, or to any other application and/or functionality.

With reference to the example of fig. 1, reference number 10 has been

used to indicate an any way shaped support base, provided with a first annular track 11 along which a first lower carriage 12 slides.

A second track 13 for a second upper carriage 14 is supported by an arm 15 on one side of the support base 10, in a position overlying the lower track 11.

The two tracks 11 and 13 are coaxially arranged and extend along identical annular paths.

Also in figure 1, reference 16 has been used to indicate a spherical floating body, for example imitating the earth or a generic planet which orbits around a sun represented by a small bright spotlight 17.

In the case of the orbital calendar of fig. 1, the support base 10 is divided into twelve base sections corresponding to the twelve months of the solar year; each base section of the support base 10 comprises a screen or display unit 18 for displaying data and/or information related to the movement of the body 16, and to the months of the year in the example shown.

Each screen 18 can be shaped in any way; for example, as shown in figure 2 the screen 18 can comprise a first display zone 18a for indicating an year, a second display zone 18b relating to a month, a third display zone 18c relating to the days of the month, and a fourth display zone 18d relating to the day hours.

Lastly, the apparatus of figure 1 comprises a main electronic control and program unit, not shown, housed in the base support 10, or provided on board the individual carriages.

As mentioned previously, the floating body 16, in the specific case reproducing the earth or another solar satellite, is made to levitate in a floating condition, and is magnetically entrained and conveyed along an orbital or running path, between the two sliding tracks 11 and 13 for the lower carriage 12, and respectively for the upper carriage 14.

The upper track 13 and carriage 14 for magnetic levitation and entrainment of the floating body 16, are shown in detail in figures 3 and 4.

As shown, the carriage 14 runs on side wheels along an electrified track 13 comprising, for example, two or more metal conductors 19 for supplying power to the electric drive motor 20 of the carriage, and an electromagnet or

solenoid SL1 for levitation and entrainment or conveyance of the spherical body 16. The solenoid SL1 comprises a magnetic core 21 consisting of a permanent magnet, surrounded by a winding 21', which extends downwards from the carriage 14 through the electrified track 13, to create a levitation magnetic field; the solenoid SL interacts with a magnet M1 of the spherical body 16 which must be floatingly supported and made to levitate as it is entrained and conveyed along the orbital path defined between the two tracks 11 and 13.

Reference number 22 in figure 4 has been used to indicate a first sensor for detecting the actual vertical position of the floating body 16, with respect to the upper carriage 14, for example a "Hall" effect probe, while reference number 23 in figure 3 has been used to indicate a second sensor for detecting the real position of the carriage 14 along the track 13.

The detecting sensor 23, likewise to the detecting sensor 22, can be of any type; in the case shown the sensor 23 consists of an electric contact sliding along a conductor 24 which extends along the entire track 13; the conductor 24 is provided with a set of small contact areas 24', evenly spaced apart by a constant pitch, for supplying the control unit of the system with timing signals indicative of the real positions of the carriage along the track 13, thereby indicative of the actual longitudinal positions of the spherical body 16 along the orbital path.

In the example under consideration, in which the system reproduces the orbital and rotational movements of the earth around the sun, the detecting sensor 23 and the contact areas 24' of the conductor 24, supply also control signals indicative of the months, days and hours related to the orbital position of the spherical body 16, in perfect synchronism with the actual position of the body 16 with respect to the sun represented by the spotlight 17.

Power can be supplied to the electric motor 20, the solenoid 21 and the to two sensors 22 and 23 in any appropriate way; for example, for the motor 20 the power is supplied by the sliding contacts 26' along the electrical conduits 19, which are connected to an external electric power source, as well as to the electronic control unit, or to an on board electric power source of the carriage itself.

The spherical body 16, in addition to be floatingly supported by levitation, and magnetically entrained and conveyed by the upper carriage 14, can also be made to rotate around an its own rotational axis, in synchronism with orbital movement.

In the example under consideration, this can be achieved by the lower carriage 12, represented in the detail of figure 5, which is made to run along the track 11 in perfect synchronism with the upper carriage 14.

In figure 5, to simplify the description, the same reference numbers of figure 3 have been used to indicate similar or equivalent parts.

The carriage 12 of figure 5 differs from the carriage 14 in that it has the function of causing the rotation of the spherical body 16 around a vertical axis. In this connection the spherical body 16, on the side facing the lower carriage 12, is provided with two permanent magnets M2 and M3, appropriately spaced apart, which interact with two diametrically opposed permanent magnets M4, M5 on a flywheel 27 on the carriage 12; the flywheel 27 is made to rotate on a vertical axis in synchronism with the movement of the carriage 12, by an electric motor 28. In figure 5, reference numbers 20' and 26' have been used to indicate the drive motor and the sliding contacts for power supply.

Figure. 6 shows the block diagram of a control unit for controlling the levitation of the spherical body 16; as can be seen from this figure, the control unit comprises a microprocessor MP which governs the entire operation of the system; the microprocessor MP is connected to the winding 21' of the solenoid SL1 by a current control block 30 for controlling the current fed to the winding 21'; the microprocessor MP is connected also to the detecting sensor 22 for detecting the vertical position of the spherical body 16, by an A/D converter 31 for analogic-digital conversion of the control signals provided by sensor 22. Lastly, reference 32 has been used to indicate an electric power supply block, connected to the microprocessor MP and to the current control block 30 powering the solenoid SL1 for generation of the levitation magnetic field.

Fig. 7 shows the block diagram of the control circuit for controlling the movement of the carriages 12 and 14 along the respective tracks 11 and 13, and consequently for controlling the orbiting movement of the spherical body 16, or

more in general the movement of a magnetically floating object as it is entrained and conveyed along a linear or annular path, depending upon the circumstances.

According to the example of fig. 7, the control circuit for the carriages 12 and 14 again comprises the microprocessor MP having outlets connected to the motor driver blocks 33 and 34 for the motor 20 of the upper carriage 14, and respectively the motor 20' of the lower carriage 12.

The microprocessor MP is connected also to the set of contacts 24', to receive positioning signals indicative of the positions of the carriages 12 and 14 with respect to the tracks 11 and 13, and control signals as will be explained further on.

In particular, the contacts 24' indicative of the positions of the two carriages 12 and 14, are connected to respective inlets of the microprocessor MP by pulse counting blocks 35 and 36 for counting the number of pulse signals relating to the positions of the upper and lower carriages 12, 14, and consequently of the floating body 16 along the orbiting path.

Further inlets of the microprocessor MP are in turn connected to the contacts 19 and 19' for power feeding the drive motors 20 and 20' for the carriages 12 and 14.

Figure 8. in turn shows the control circuit for controlling the rotational movement of the floating body 16, around its own axis, whenever such function is contemplated, as in the example under consideration.

In particular, from figure 8 it can again be seen that the microprocessor MP is connected to a drive block 37 for the motor 28 which controls the rotation of the flywheel 27 supporting the two magnets M4 and M5 which interact with the magnets M2 and M3 of the floating body 16 for imparting a rotary movement to the latter; the microprocessor MP is also connected to a sliding contact of the motor 28 to receive control signals indicative of the angular position of the flywheel 27 consequently of the floating body 16 in relation to the orbital movement.

Lastly, the microprocessor MP is connected to a date control circuit 38 which control the screens 18 displaying the date and hour in relation to the

position of the floating body 16 along the orbital path, or to provide other information and/or messages depending on the requirements and the specific use of the levitation system according to the invention.

With reference to the flow chart of figure 9 a brief description will be now given of the operative mode of the levitation system according to the example of figure 6, in which the core 21 of the solenoid SL1 consists of a magnet.

As shown in fig. 9, the step S1 relating to the start of data processing by the microprocessor MP, is followed by a subsequent step S2 during which the value B (Weber) of the magnetic field for levitation of the body 16, is detected by the sensor 22.

In a subsequent step S3, the value B (Weber) of the detected magnetic field is compared with a threshold value BS stored in the microprocessor MP of the processing unit. If the detected value B of the magnetic field does not exceed the threshold value BS (NO), the system goes on to step S4 during which the floating body 16 tends to rise, in that the magnet M1 is attracted by the magnet 21 of the levitation solenoid SL1. The two magnets M1 and 21, on moving closer to each other, tend to increase the value B of the magnetic field which is continuously detected by the sensor 22, step S3.

Conversely, if the value B of the detected magnetic field exceeds the threshold value BS (YES), the system goes on to step S5 during which, a current of appropriate value is made to flow through the coil 21' of the solenoid SL1, for a time t_o controlled by the microprocessor MP, which induces a supplementary magnetic field B' in a direction opposite to direction of the magnetic field generated by the magnet 21' of the levitation solenoid.

The supplementary magnetic field B' consequently tends to repel the magnet M1 and to cause the suspended body 16 to fall down; when the two magnets M1 and 21 move away from each other, the value of the resulting magnetic field tends to decrease, step S6, until it drops below the threshold value BS, returning to step S3. In this way the system will continue to control the vertical position of the floating body 16, maintaining the same suspended in a levitated condition of stable equilibrium.

Fig. 9A shows a flow chart similar to that of fig. 9, in the case in which the

core 21 of the solenoid SL1 is composed exclusively of a ferromagnetic or magnetically conductive material.

The steps S1' and S2' are identical to the steps S1 and S2 of the preceding example. Conversely, in fig. 9A, if the response to step S3' is positive (YES), the current flowing through the coil 21' of the solenoid SL1 will be interrupted, or reduced. The value B of the magnetic field detected by the sensor 22 decreases and the floating body 16 tends to fall down, step S4', bringing the system back again to step S3'.

If the response is negative (NO), the system goes on to step S5' during which the current is made to flow through the coil 21' of the solenoid SL1, or is increased. The magnetic field detected by the sensor 22 consequently tends to increase its value B and the floating body 16 will tend to rise towards the solenoid SL1.

At this point, the system goes on to the subsequent step S6' in which the magnet M1, on moving closer to the solenoid SL1, generates a more intense magnetic field; the system then returns to step S3', self-adjusting to maintain the floating body 16 in a suspended condition of stable equilibrium.

Simultaneously to the control of the levitation of the floating body 16, in a substantially similar way the system controls the positions of the carriages 12 and 14 and consequently the position of the floating body 16 along the orbital path, as well as controls the rotation of the body 16, wherever contemplated, and the data which in succession appear on the display screens 18.

The above is shown in the flow charts of figures 10 and 11.

In the case of figure 10 relating to the control of the position of the carriages along the sliding tracks, after the start of data processing by the microprocessor MP, step S1, the electric power is supplied to the motors, step S7, then the system goes on to step S8 in which it checks whether the position at the beginning of the year, in the case of the example of fig. 1, has been activated.

If the response is NO, the system returns to step S7; if the response is YES, the system goes on to step S9 for supplying power to the drive motors of the carriages.

In the subsequent step S10, during the movement of the carriages, the system carries out the counting of the contacts 24', along the sliding tracks. If the response is NO the system returns to step S9; if the response is YES the system goes on to step S11 during which increases the counting which determines the position in relation to the current time.

During the subsequent step S12 the system checks whether the position relating to the date set has been reached. If NO, returns to step S9; if YES the system goes on to step S13 during which waits until a time to has elapsed before resetting the position and reactivating step S9 for supplying power to the electric motors of the carriages.

The flow chart of fig. 11, vice versa, concerns the rotational control for the floating body 16 in the example of fig. 1.

Again, after steps S1 and S7, during the step S14 the microprocessor verifies the activation of a contact which determines hour 00:00 at the beginning the orbiting year, or at the start of the movement of the floating body.

If the response is NO, the system returns to step S7; if YES, it goes on to step S15 for activation of the power supply to the electric motor, causing the rotation of the floating body 16. In a subsequent step S16 the system checks the activation of a contact which determines the hourly position, or the angular position of the floating body 16; if the check is negative, NO, the system returns to step S15; if the check is positive, YES, the system goes on to step S17 during which increases the value of a variable relating to the position of the body 16. If the correct position is not reached, NO, in relation to the current hour, step S18, the system returns to step S15; conversely, YES, the system during step S19 waits until a minimum time to has elapsed before reactivating step S15 for supplying power to the electric motor.

In the case of figures 1-5, the system is provided with an upper carriage 14, for supporting and magnetically entraining and conveying the floating body 16, and a lower carriage 12, moved in synchronism with the previous one, for rotation of the floating body 16 around an its own axis.

The magnetic levitation, entrainment, conveyance and rotation of the floating body 16 can be combined in a single carriage movable along a single

sliding track.

A solution is shown in figures 12 and 13 in which the body 16 is supported from above by a single upper carriage 14; in figures 12 and 13 some reference numbers of the previous example have again been used to indicate similar or equivalent parts.

The example of figure 12 differs from the preceding example of figure 3 in that the upper carriage 14 in the case of figure 12 is provided with two solenoids SL2 and SL3, facing downwards, for magnetic levitation, entrainment, conveyance and rotation of the floating body 16, whose position is again detected by the sensor 22; in this case the magnet M1 of the floating body 16 has been omitted, while the magnets M2 and M3 are now positioned in the upper portion of the floating body 16 to interact with the magnetic fields of two downwardly facing solenoids SL2 and SL3.

The two solenoids SL2 and SL3 are arranged on a flywheel 27' to rotate around a vertical axis controlled by the electric motor 28', whilst reference 20 has again been used to indicate the drive motor for the carriage 14.

The solution of fig. 12 can again be used either for an orbital calendar as in the preceding case, or for other functionalities.

Figures 14 and 15 show a further embodiment in which a floating body 16', in the form of a pyramid, is magnetically supported from below, is entrained and conveyed and/or made to rotate by three solenoids SL4, SL5 and SL6 on a lower carriage 12.

Again, in figures 14 and 15 the same reference numbers have been used to indicate similar or equivalent parts. In the case of figures 14 and 15 three solenoids SL4, SL5 and SL6 are supported by a flywheel 27" made to rotate by an electric motor 28"; the solenoids are facing upwards to interact with three magnets M6, M7 and M8 at the base of a floating body 16 in the form of a pyramid. For all the remainder, the controls for the magnetic levitation of the floating body 16', its entrainment, conveyance and rotation, take place as in the preceding cases.

Again, the embodiment of figures 14 and 15 can be used to provide an orbital calendar, as in the case of fig. 1, or for other functionalities.

The system for magnetic levitation and conveyance according to the invention can be used for carrying out two or more appropriately correlated and/or different functionalities.

In the case of fig. 1 the levitation system has been suggested for carrying out the function of an orbital calendar, or another equivalent function.

The system can be used for carrying out other functions, for example a horoscope.

In this case, by means of an additional display (not shown) or by means of designs on appropriate faces or surfaces of the floating body 16 or 16', it is possible to display all the signs of the zodiac.

The features or characteristics of each zodiac sign may be made visible by wordings and/or images, and/or made audible by audio devices. It is possible to achieve the daily updating of the horoscope by connecting the system to remote data updating devices, via SMS, blue-tooth, Internet and other transmission system.

In place of, or in addition to the aforementioned functions, the system can be used for providing a biorhythm. In this case, on the basis of the date of birth and other information to be stored in the microprocessor MP, or other processing unit, the floating body 16 or 16' can be used for supplying the user information and data concerning his/her biorhythm. For example, it will be possible to programme the orbital speed or other movement of the floating body 16 o 16', and/or the speed of rotation around its own axis, in relation to the user's biorhythmic characteristics appropriately calculated by the system, independently of other functions which can remain unchanged.

A third function can be that of a diary; in this case the system can be used to store dates, appointments, notes, vocal messages, memos and the like, which at the appropriate time will be indicated or brought to the user's attention by signals, such as for example acoustic or luminous signals, or rapid rotation of the floating body on the date and/or hour set by the same user.

The function of a diary may also be used in turn, for sending/receiving telephone calls, as a telephone answering system, sending/receiving SMS, MMS messages and the like. These functions can be achieved by means of

appropriate devices or means for connection to a GSM, GPRS fixed or mobile telephony network, by providing suitable additional visual and audio signal receiving and/or transmitting devices.

The system may also be integrated by appropriate devices for reading magnetic media in different digital or other types of formats, for example MP3, MPEG for the playback of video clips and/or music.

Lastly, the system can be used for carrying out the function of an interface with PC or remote devices, such as cellular telephones, handheld computers or other electronic equipment. The interfacing with external devices will make it possible to achieve the aforementioned functions and to add further functions that can be personalised by the user, and even allow the total control of the floating body by a remote device. For example, it would be possible to activate the rapid rotation of the floating body, or stop its movement, by sending an SMS or other type of message, or to directly control all the functions existing in the system from a personal or handheld computer.

A second application field can consist in transporting and conveying objects along a pre-established annular or linear path. The system must be understood as an alternative to the conventional transporting and/or conveying systems.

In this case it is possible to transport objects from one workstation to another, or to several workstations, by simply suspending a suitable magnetic platform on a system of solenoids provide on a levitation carriage movable along a sliding track.

A further field of application can consist in advertising messages and similar purposes. For example, the system can be used for displaying advertising messages on a magnetically suspended moving and/or rotating object, as in the example shown in the embodiments of figures 12 and 14.

Lastly, its use is possible in the field of games; for example it can be used for constructing tracks for cars or "flying objects", as an alternative to the conventional tracks for cars or toy trains which run on electrified tracks. The novelty, lies in making the objects fly without friction forces, being able to control their speed and suspension height from the ground. This makes it possible to

develop crossing conditions on different levels, in such a way as to increase the level of difficulty and of skill of the user, and the amusement degree.

A simple example of use in the games field is shown in figures 16 and 17 of the drawings, where reference numbers 40 and 42 have been used to indicate paired tracks for levitation or magnetic support and sliding of separate objects, for example in the form of two shuttles 42, 43, which can also be provided with one or more wagons 44; the shuttles and the wagons are magnetically floated by corresponding levitation carriages 45, for example of the type shown in fig. 12, provided with or devoid of the movement of rotation of the levitated body or object.

Reference 46 in fig. 17 has also been used to indicate an electric power supply, while references 47 and 48 have been used to represent two control consoles.

From what has been described and shown with reference to the accompanying drawings, it will be clear that what is provided is a system for magnetic levitation, entrainment and conveyance of bodies suspended and entrained by appropriate carriages, for carrying out one or more correlated and/or different functions.

It is understood however that what has been described with reference to the accompanying drawings has been given purely in order to illustrate the general features of the system, and to provide examples of several solutions and/or applications.

Consequently, other modifications and/or variations may be made to the system, to its various applications and/or functions, without thereby departing from the claims.

CLAIMS

1. A system for magnetic levitation, entrainment and conveyance of a floating body (16; 42, 45) along a path, characterised by comprising:

at least one electrified track (11, 13; 40, 41);

motor-driven carriage means (12, 14; 45) movable along the aforesaid track (11, 13; 40, 41), the carriage means (12, 14; 45) being provided with magnetic field generating means (M; SL) for levitation, entrainment and conveyance of the floating body (16; 42, 45);

at least a first and a second detecting sensors (22, 23) for providing reference signals relating to actual vertical and longitudinal positions of the floating body (16; 42, 45) along the track on which the carriage means (12, 14; 45) runs; and

circuit means operatively connected to the electrified track (11, 13; 40, 41), to the magnetic field generating means for levitation, entrainment and conveyance of the floating body (16; 42, 45), and to the detecting sensors (22, 23), said circuit means comprising an electronic control unit (MP) programmed to supply control signals in relation to reference signals indicative of the positions of the floating body (16; 42, 45), and of the carriage means (12, 14; 45), received by the detecting sensors (22, 23).

2. The system according to claim 1, characterised by comprising magnetic means (27, M, SL) for controlling rotational movement of the floating body (16) around a rotational axis.

3. The system according to claim 2, suitable for an orbital calendar, characterised by comprising a floating body (16) consisting of a spherical body orbiting along an annular path;

a plurality of data display screens (18), in correspondence with track sectors along said annular path; and

in that the electronic control unit (MP) is programmed to display in sequence, on each screen (18), stored data relating to floating body positions in correspondence with each track sector of the annular path.

4. The system according to claim 3, characterised in that the electronic

control unit (MP) is programmed to display, on each screen (18), date and/or hour relating to positions of the floating body along the annular path.

5. The system according to claim 3, characterised in that the electronic control unit (MP) is programmed to display on screens (18), the birth date and specific information relating to biorhythm of an user; and

in that the electronic control unit (MP) is programmed to modify the movement of the floating body (16) in relation to biorhythm data and information stored in the same control unit (MP).

6. The system according to claim 3 or 4, characterised in that the display screens (18) and/or the floating body (16) are provided with zodiac signs, and the electronic control unit is programmed to provide visual and/or voice data signals and information relating to the characteristics of each individual zodiac sign.

7. The system according to claimed in claim 6, characterised in that the electronic control unit (MP) is connected to updating devices for updating data and information relating to the characteristics of the individual zodiac sign.

8. The system according to claim 3 or 4, characterised in that the electronic control unit (MP) is programmed as a diary, and in that the stored diary data are highlighted at a programmed time, by acoustic and/or luminous signals, and/or rapid changes in the movement of the floating body (16).

9. The system according to claim 3 or 4, characterised by comprising player for playback of music and/or video clips.

10. The system according to claim 3 or 4 characterised by comprising an interface for connection to fixed and/or mobile telephony networks.

11. The system according to claim 3 or 4, characterised by comprising an interface for connection to personal computers and/or remote transmitting/receiving devices, and/or for personalisable functions, for controlling the floating body (16).

12. The system according to claim 1, characterised by comprising an upper annular track (13) and a lower annular track (11) defining an annular path for the floating body (16);

a first carriage (14) movable along the upper track (13), and a second

carriage (12) movable along the lower track (11);

the first carriage (14) comprising electromagnetic means (21, 21') for generating a levitation magnetic field, entrainment and conveyance of the floating body (16);

the second carriage (12) in turn comprising rotatably supported magnet means (M4, M5) interacting with corresponding magnet means (M2, M3) of the floating body (11), to cause its rotation; and

in that each carriage (12, 14) is provided with detecting means (22, 23) for detecting its position along the sliding track (11, 13).

13. The system according to claim 1, characterised by comprising a single electrified track (13) and a supporting carriage (14) for the floating body (16); the floating body (16) and the carriage (14) comprising interactive magnetic and electromagnetic means (M2, M3, S43, S43), for generating a levitation magnetic field, entrainment and conveyance of the floating body (16).

14. The system according to claim 13, characterised in that said electromagnetic means (SL2, SL3), are rotatably supported to cause rotation of the floating body (16).

15. The system according to claim 1, characterised by comprising a single electrified track (11) and a support carriage (12) for supporting the floating body (16) from below, said body (16) and said carriage (12) comprising interactive magnetic and electromagnetic means (M6, M7, M8; SL4, SL5, SL6) for generating a levitation magnetic field, entrainment and conveyance of the floating body (16).

16. The system according to claim 15, characterised in that said electromagnetic means (SL4, SL5,SL6) are rotatably supported to cause rotation of the floating body (16).

17. The system according to claim 1 or 2, characterised in that the floating body (16) is provided with wordings, messages and/or images of advertising nature.

18. The system according to claim 1 or 2, for transporting and conveying characterised in that said floating body is in the form of a floating platform movable along a linear and/or annular path, and in that said control unit (MP) is

programmed to move and stop the platform between different workstations.

19. The system according to claim 1 or 2, characterised in that said electrified tracks (11, 13) for the floating body (16) are conformed as linearly and/or annularly shaped game paths.

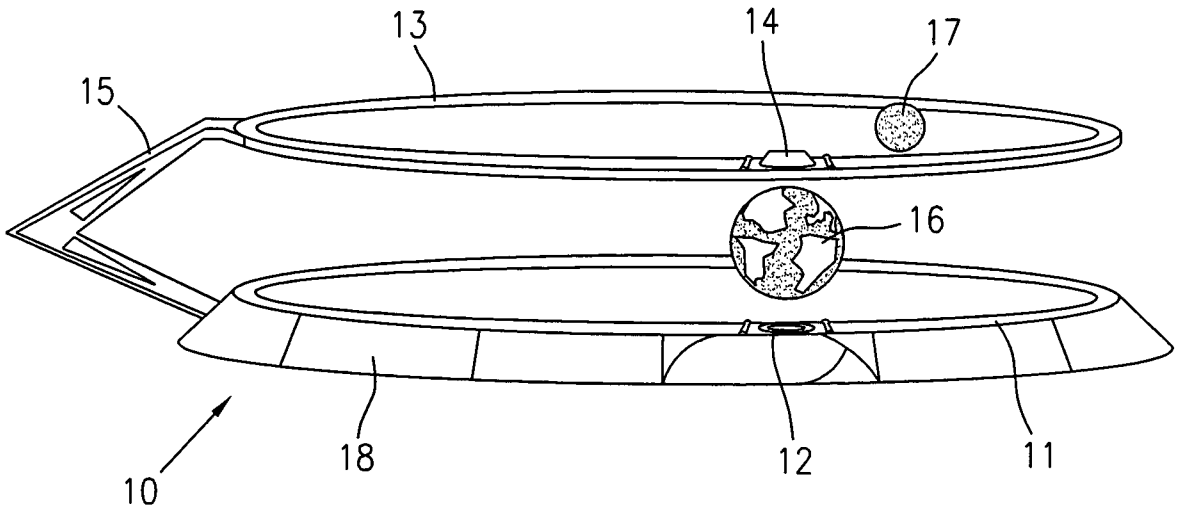

Fig. 1

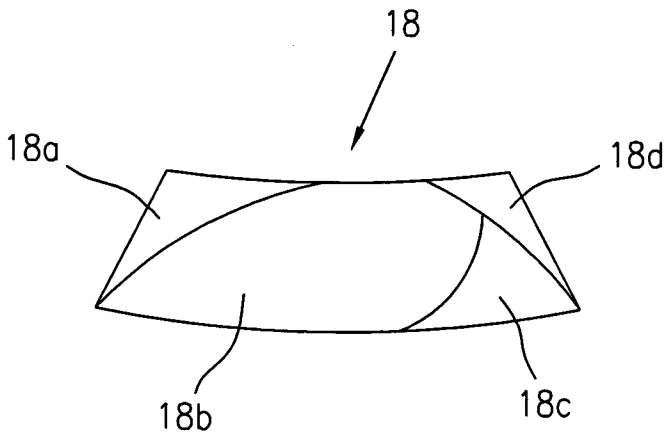

Fig. 2

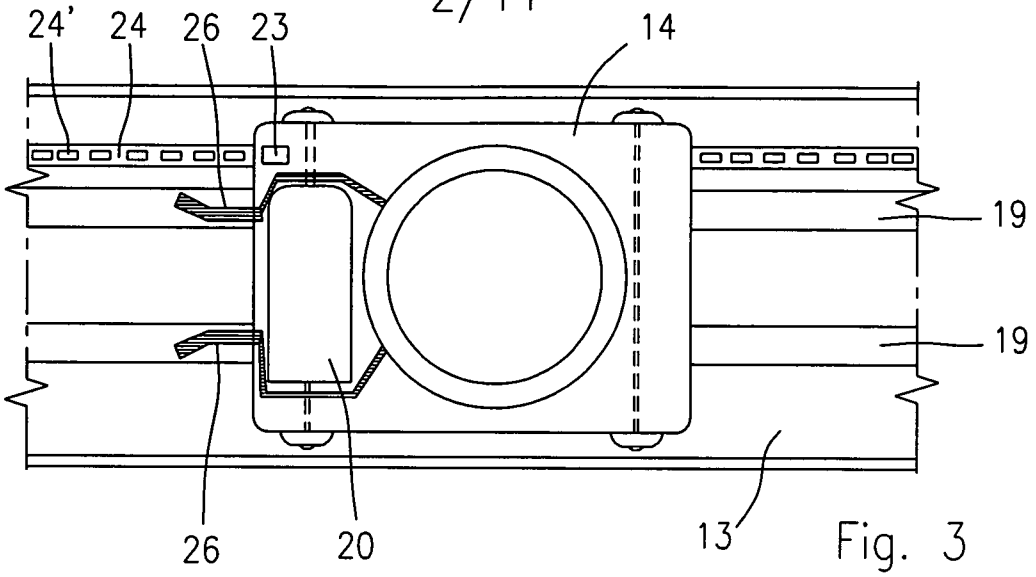

Fig. 3

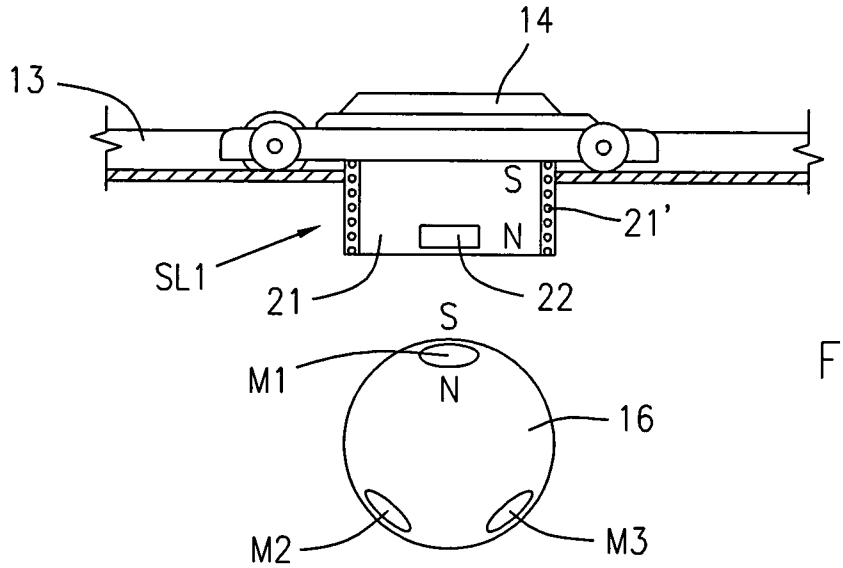

Fig. 4

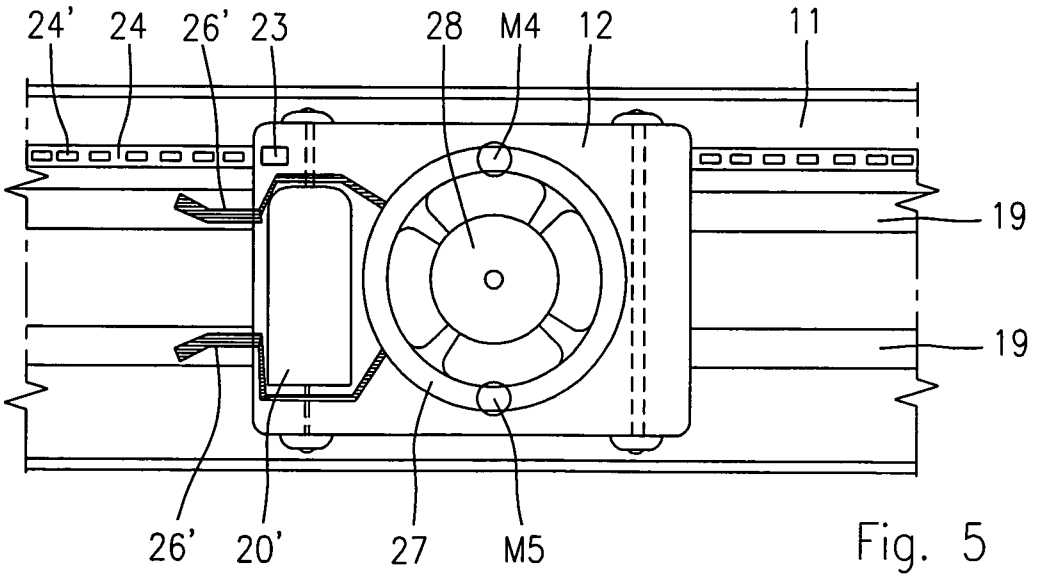

Fig. 5

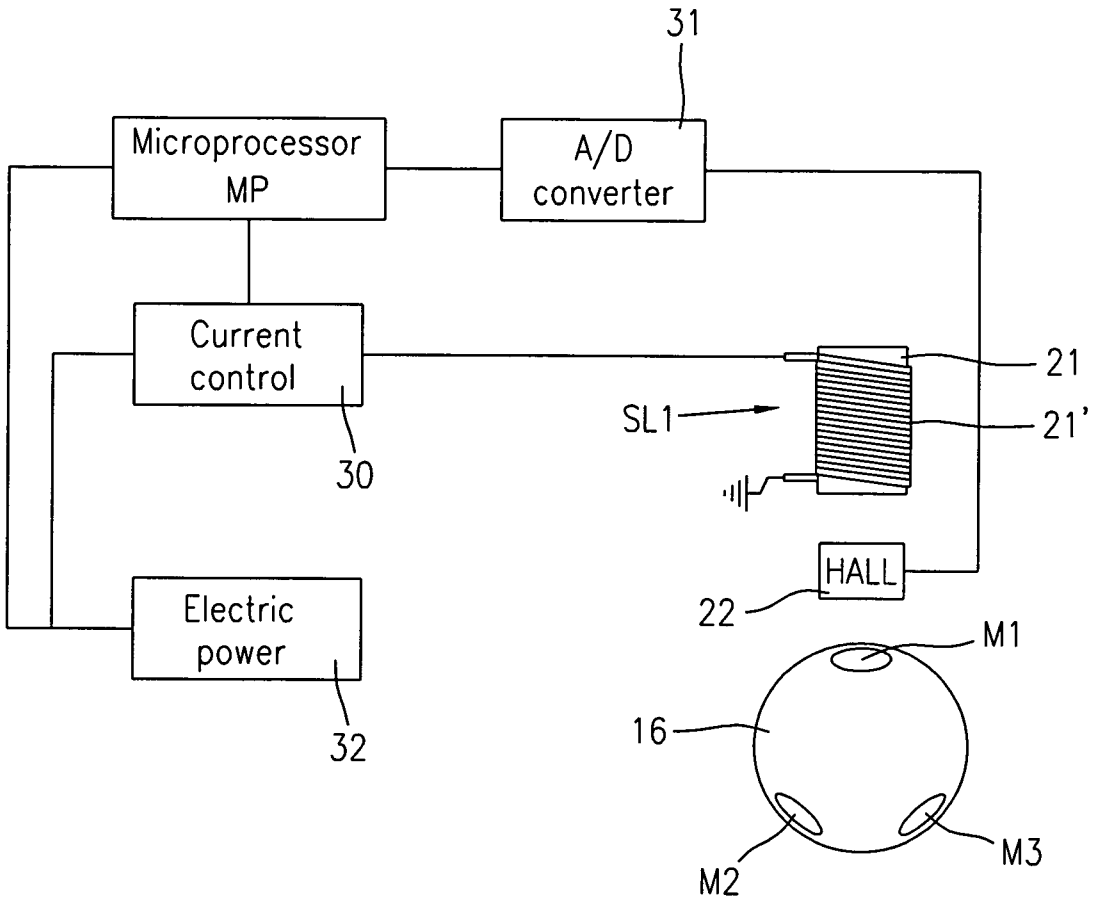
31
Microprocessor MP
A/D converter
Current control
30
21
21'
SL1
HALL
22
Electric power
32
M1
16
M2
M3

Fig.6

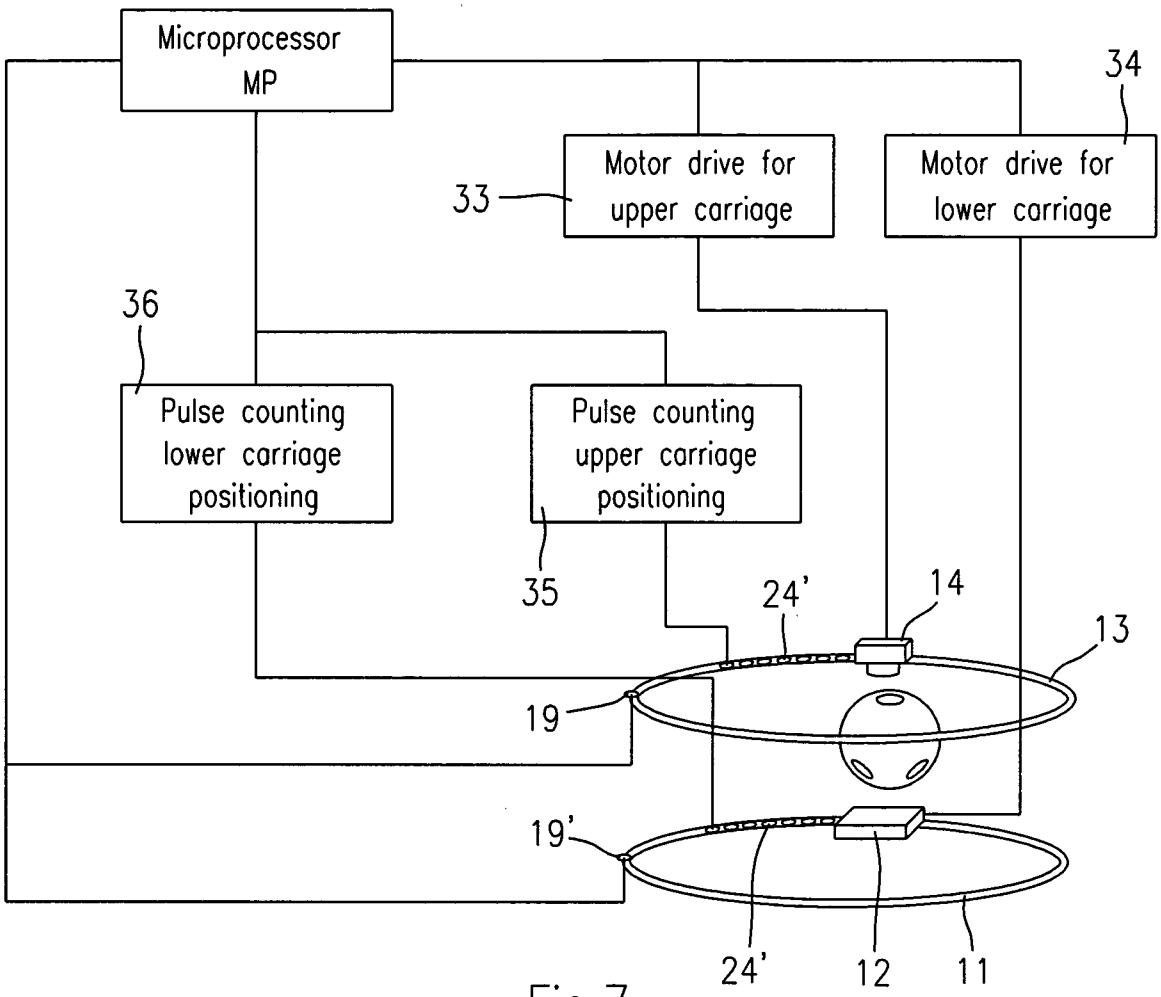
Microprocessor MP
34
Motor drive for upper carriage
33
Motor drive for lower carriage
36
Pulse counting lower carriage positioning
Pulse counting upper carriage positioning
35
24'
14
13
19
19'
24'
12
11

Fig.7

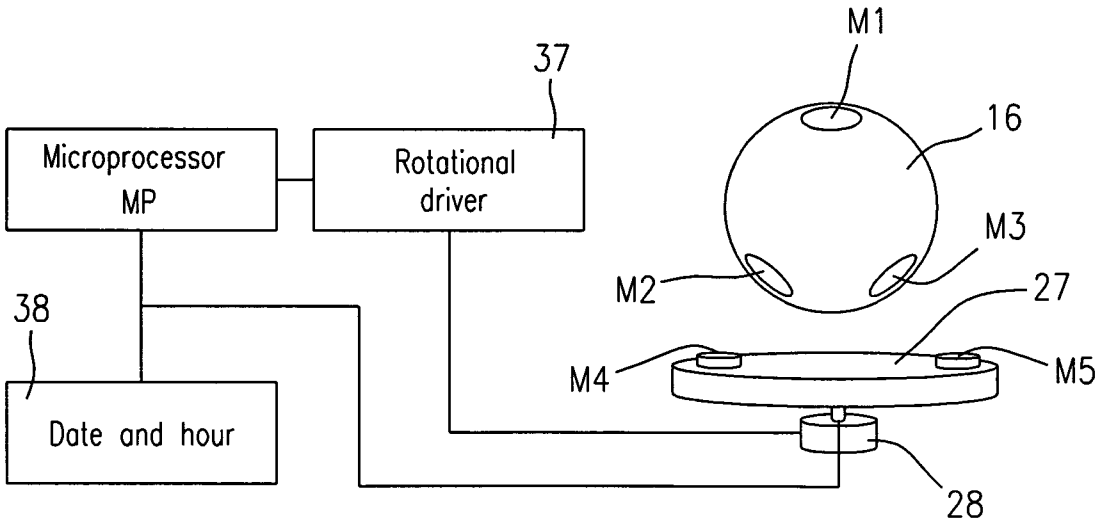
M1
37
16
Microprocessor MP
Rotational driver
M3
M2
27
38
M4
M5
Date and hour
28

Fig.8

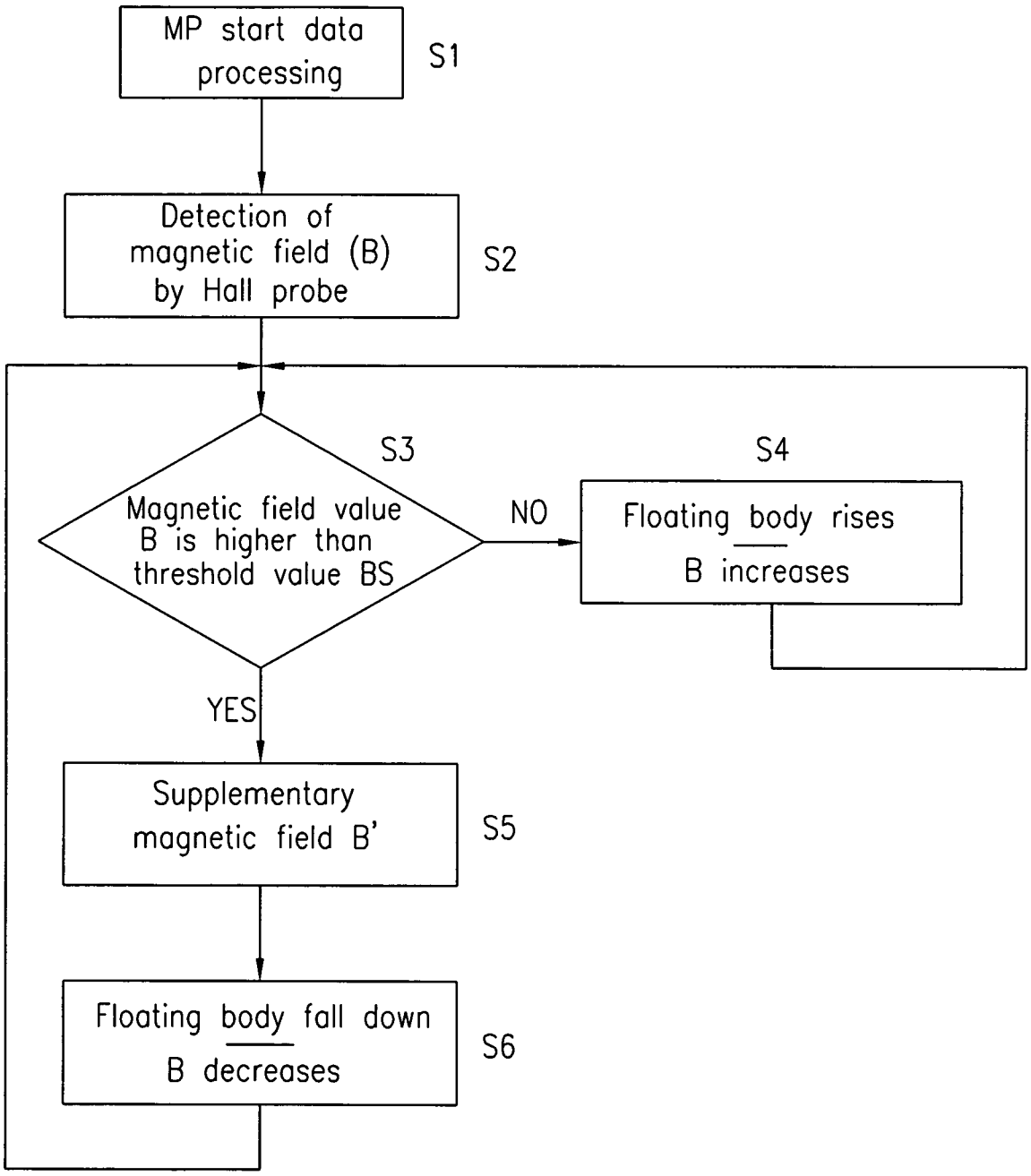
MP start data processing
S1
Detection of magnetic field (B) by Hall probe
S2
S3
Magnetic field value B is higher than threshold value BS
NO
S4
Floating body rises
B increases
YES
Supplementary magnetic field B'
S5
Floating body fall down
B decreases
S6

Fig.9

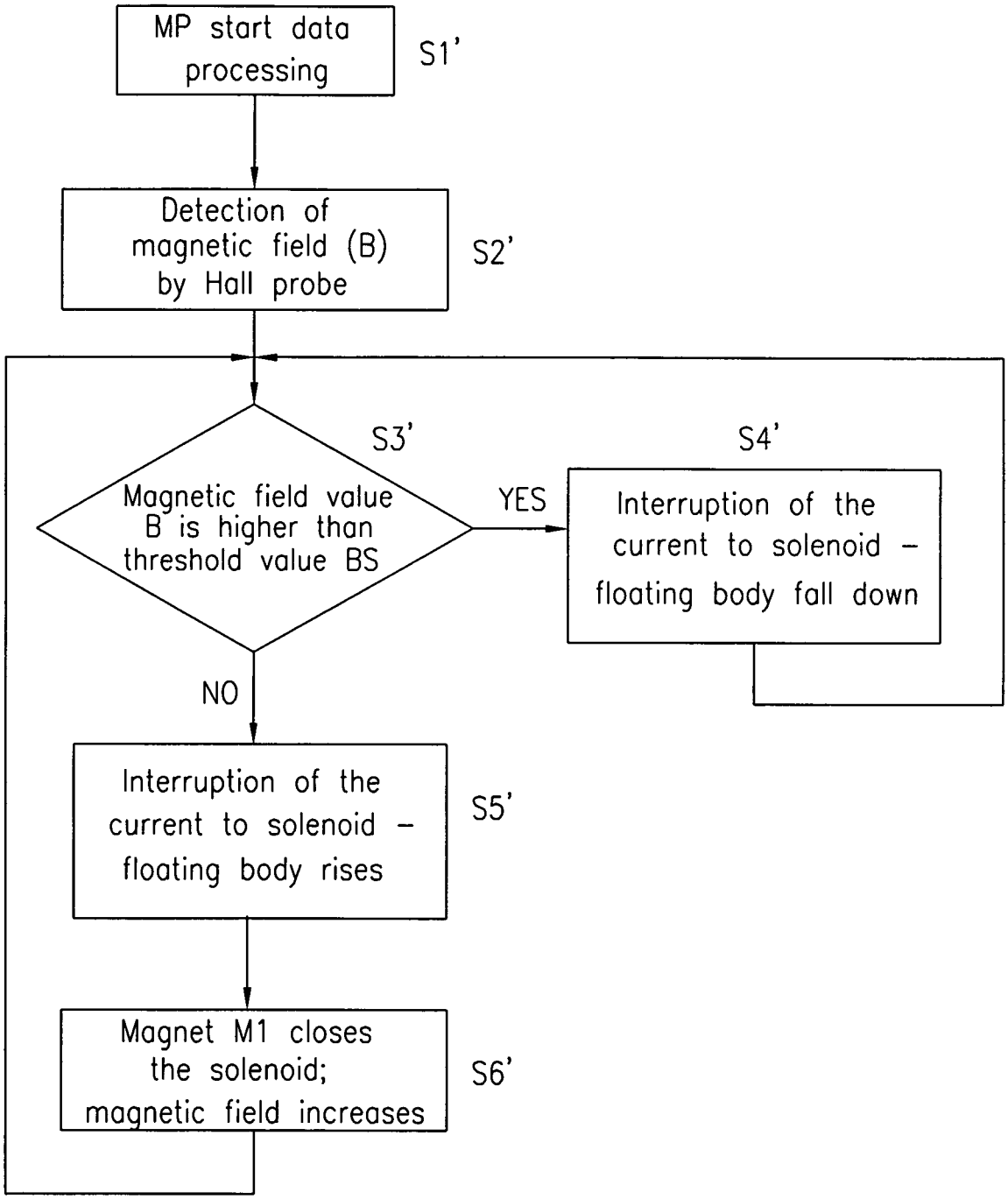
MP start data processing
S1'
Detection of magnetic field (B) by Hall probe
S2'
S3'
Magnetic field value B is higher than threshold value BS
YES
S4'
Interruption of the current to solenoid – floating body fall down
NO
Interruption of the current to solenoid – floating body rises
S5'
Magnet M1 closes the solenoid; magnetic field increases
S6'

Fig.9A

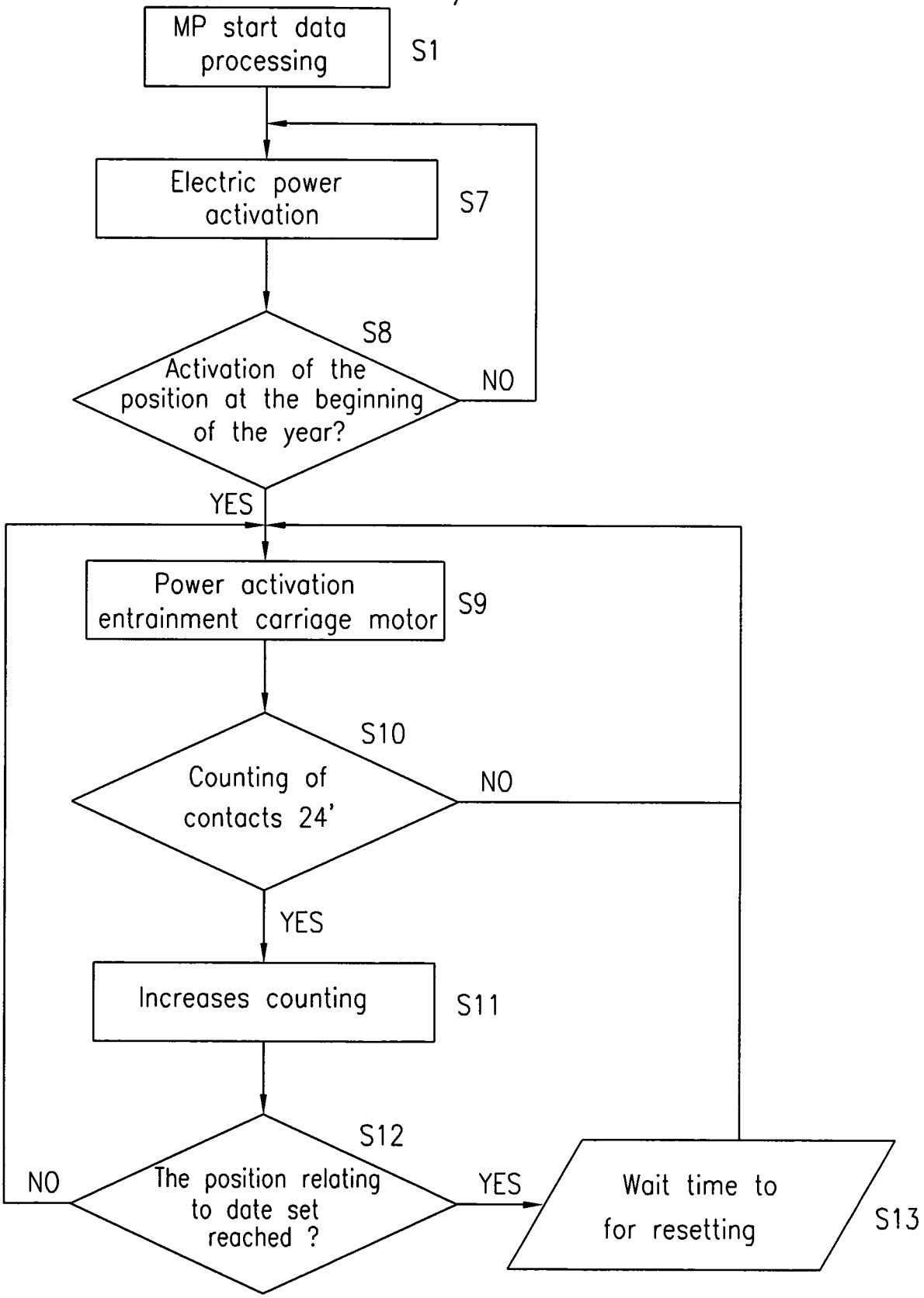
MP start data processing
S1
Electric power activation
S7
S8
Activation of the position at the beginning of the year?
NO
YES
Power activation entrainment carriage motor
S9
S10
Counting of contacts 24'
NO
YES
Increases counting
S11
S12
The position relating to date set reached ?
NO
YES
Wait time to for resetting
S13

Fig.10

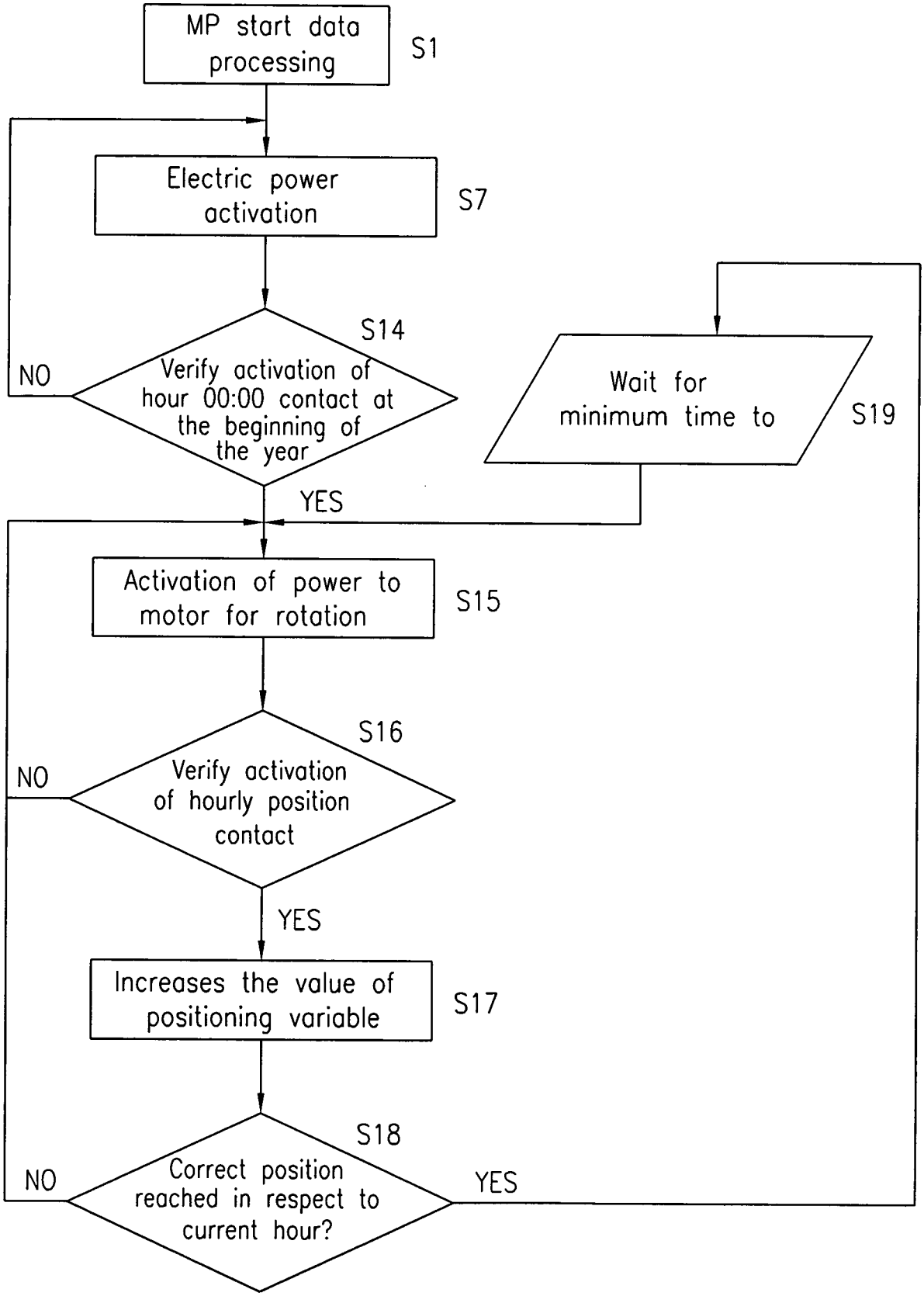
MP start data processing
S1
Electric power activation
S7
S14
Verify activation of hour 00:00 contact at the beginning of the year
NO
YES
Wait for minimum time to
S19
Activation of power to motor for rotation
S15
S16
Verify activation of hourly position contact
NO
YES
Increases the value of positioning variable
S17
S18
Correct position reached in respect to current hour?
NO
YES

Fig.11

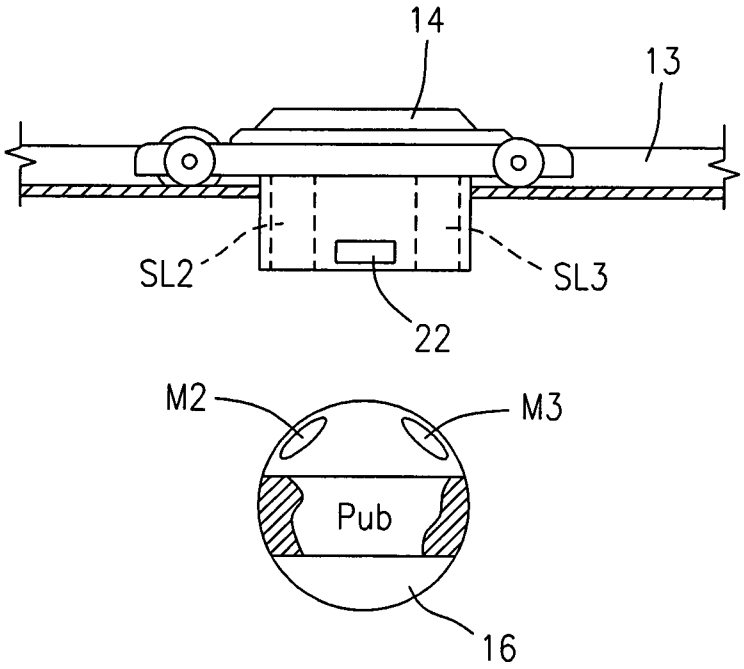
14
13
SL2
SL3
22
M2
M3
Pub
16

Fig. 12

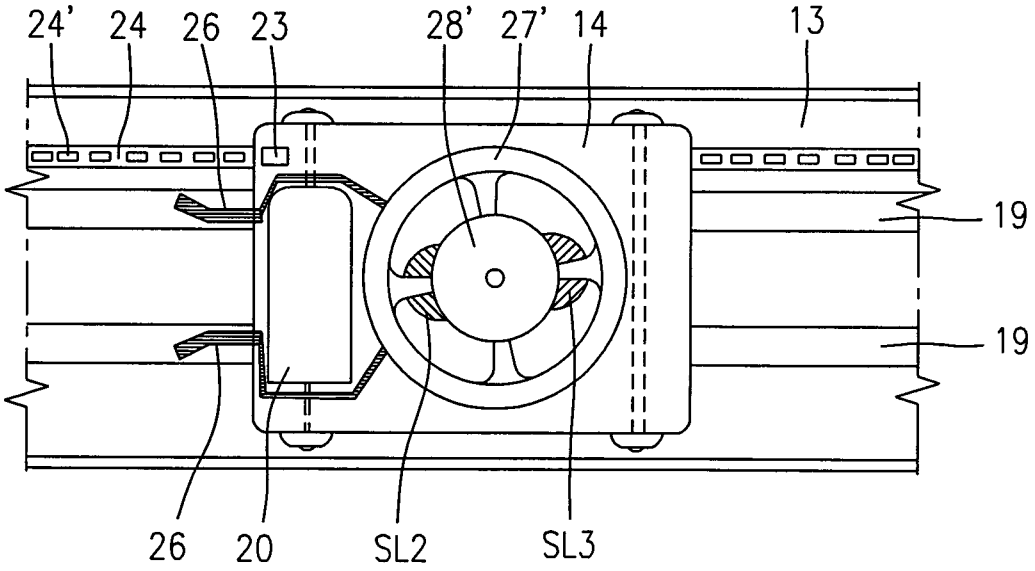
24'
24
26
23
28'
27'
14
13
19
19
26
20
SL2
SL3

Fig. 13

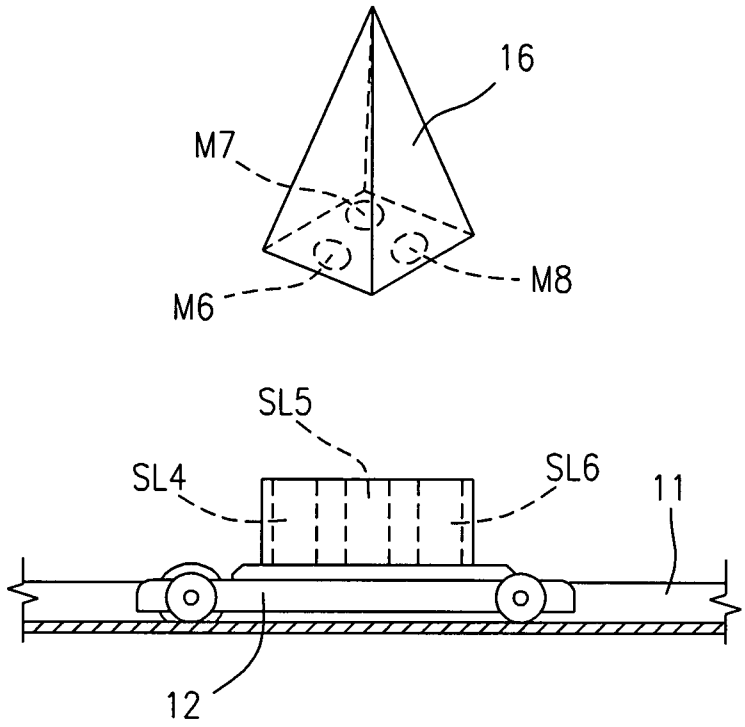
16
M7
M6
M8
SL5
SL4
SL6
11
12

Fig. 14

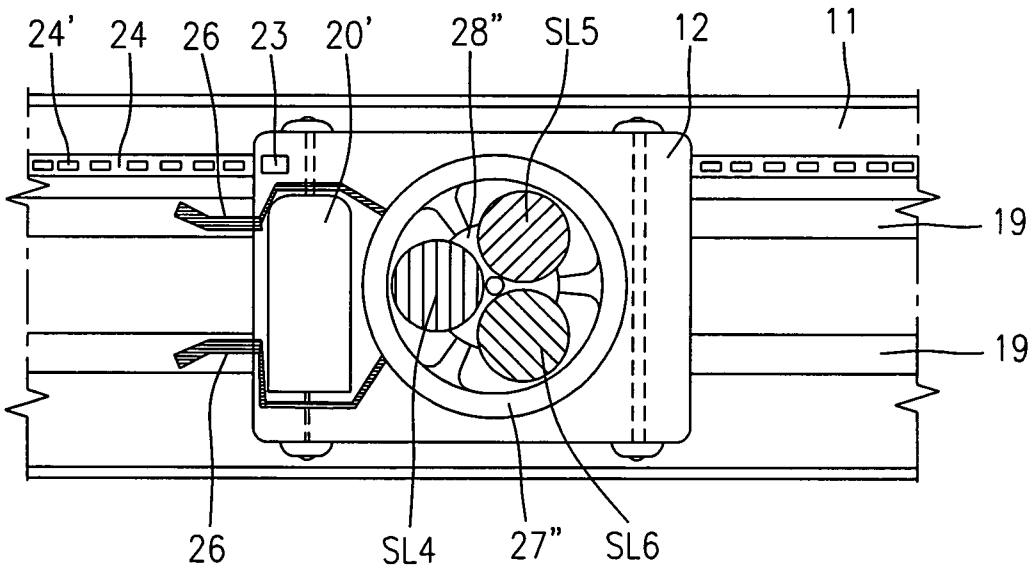
24'
24
26
23
20'
28"
SL5
12
11
19
19
26
SL4
27"
SL6

Fig. 15

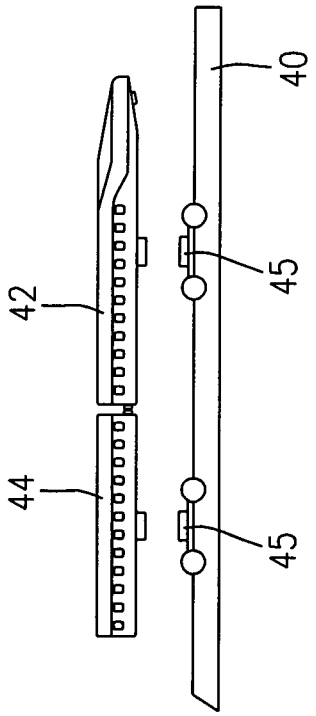

Fig. 17

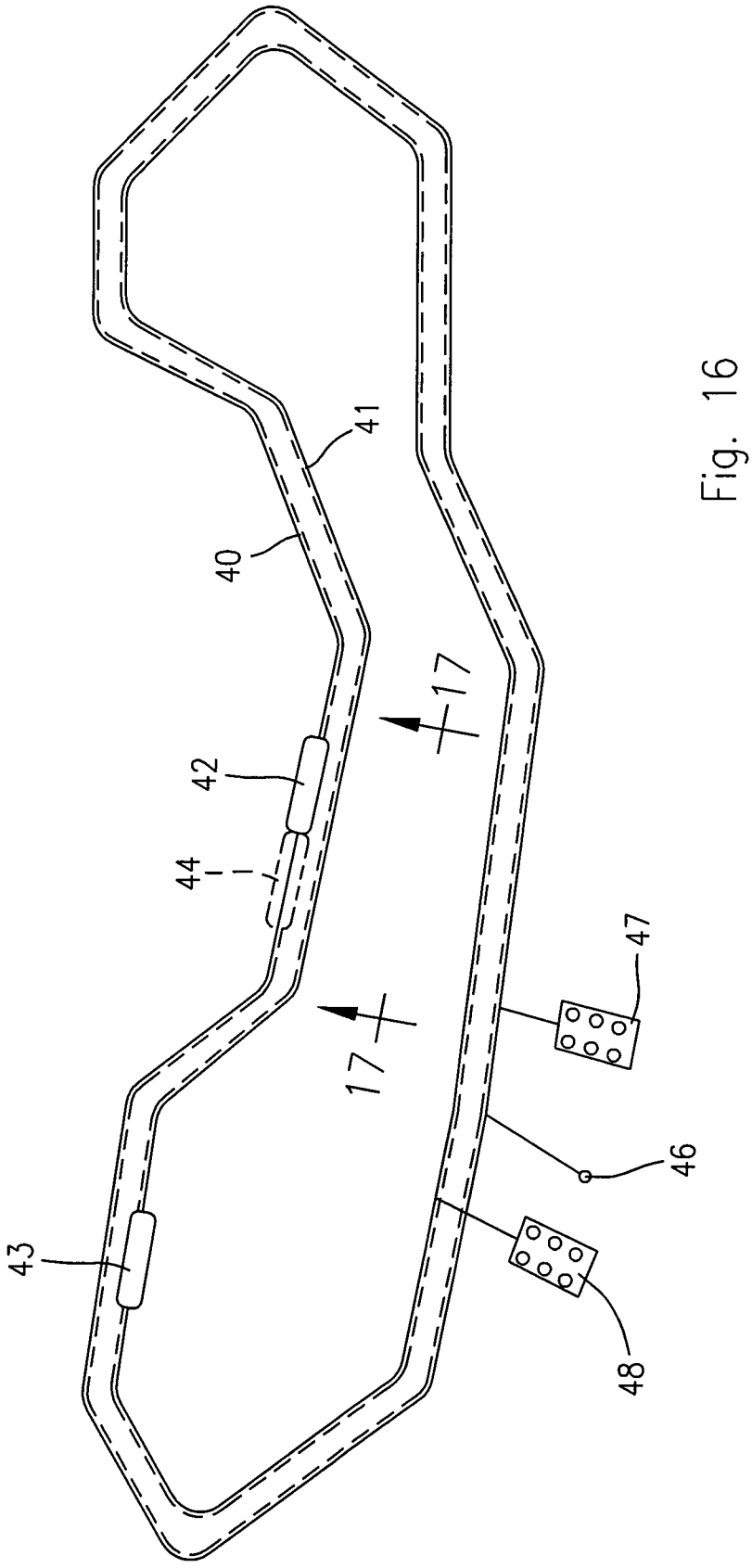

Fig. 16

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/007017

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02N15/00 G04C17/00 G04B45/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02N G04C B61B B60M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 21 25 648 A1 (GRUBER B) 21 December 1972 (1972-12-21) the whole document	1
A	US 6 269 563 B1 (DAGAN GIDEON [US]) 7 August 2001 (2001-08-07) figures 1,2 columns 1,3	1
A	US 4 585 282 A (BOSLEY ROBERT W [US]) 29 April 1986 (1986-04-29) figure 13	1
A	US 5 805 531 A (SCHAEFER ROY [DE]) 8 September 1998 (1998-09-08) figures 1-11	1

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 October 2006	08/11/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Le Chenadec, Hervé

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/007017

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 723 232 A (BEEBE WILLIAM B [US]) 2 February 1988 (1988-02-02) figures 1,2,6,7	1
A	US 4 712 925 A (BEEBE WILLIAM B [US]) 15 December 1987 (1987-12-15) figures 5-9	1
A	US 5 638 340 A (SCHIEFELE WALTER P [US]) 10 June 1997 (1997-06-10) figures 1,2	1
A	BE 1 010 332 A6 (SMOES ANNE MARIE [BE]) 2 June 1998 (1998-06-02) figures 1,2	1
A	DE 37 18 835 A1 (KNAUER ROLAND DIPL ING [DE]) 15 December 1988 (1988-12-15) figure 1	1

3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2006/007017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 6269563 B1	07-08-2001	NONE	
US 4585282 A	29-04-1986	NONE	
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US 5638340 A	10-06-1997	NONE	
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